Sex Differences in PTSD Symptoms: A Differential Item Functioning Approach

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Sex Differences in PTSD Symptoms: A Differential Item Functioning Approach

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Objective: Evidence has suggested there are sex differences in posttraumatic stress disorder (PTSD) symptom expression; however, few studies have assessed whether these differences are due to measurement invariance. This study aimed to examine sex differences in PTSD symptoms based on the *Diagnostic and Statistical Manual of Mental Disorders* (5th ed.; *DSM–5*) using differential item functioning (DIF). ***Method:*** Confirmatory factor analysis was conducted on the *DSM–5* model of PTSD, followed by a multiple indicators multiple causes (MIMIC) model to examine possible DIF using the PTSD Checklist for *DSM–5*. Data were analyzed from a Malaysian adolescent sample ($n = 481$) of which 61.7% were female, with a mean age of 17.03 years. ***Results:*** The results indicated the presence of DIF for 2 of 20 PTSD criteria. Females scored significantly higher on emotional cue reactivity (B4), and males reported significantly higher rates of reckless or self-destructive behavior (E2) while statistically controlling for the latent variables in the model. However, the magnitude of these item-level differences was small. ***Conclusion:*** These findings indicate that despite the presence of DIF for 2 *DSM–5* symptoms, this does not provide firm support for nonequivalence across sex.

Clinical Impact Statement
This study suggests that although sex differences were observed in 2 out of 20 posttraumatic stress disorder (PTSD) symptom criteria, the magnitude of these effects was small and may be the result of gender role stereotypes rather than a bias in diagnostic criteria. Given the paucity of studies examining sex differences in PTSD symptom expression based on the *Diagnostic and Statistical Manual of Mental Disorders* (5th ed.), more research is needed across different cultures and types of traumatic exposure before firm conclusions can be made.

Keywords: posttraumatic stress disorder, *DSM–5,* differential item functioning, gender differences, PTSD Checklist for *DSM–5*

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The *Diagnostic and Statistical Manual of Mental Disorders* (*DSM–5*: American Psychiatric Association, 2013) diagnosis of posttraumatic stress disorder (PTSD) has undergone significant changes in nosology, definition of a traumatic stressor, and the number and nature of symptom criteria (Weathers, 2017). Notably, the tripartite model was replaced with a four-factor model based on a large body of evidence from confirmatory factor analytic findings demonstrating that PTSD is better comprised of four rather than three dimensions (Yufik & Simms, 2010). The four symptom clusters are intrusions (Criterion B), avoidance (Criterion C), negative alterations in cognitions and mood (NACM; Criterion D), and alterations in arousal and reactivity (Criterion E). Additional modifications are reflected in the separation of the *DSM–IV* (American Psychiatric Association, 1994) Criterion C of active avoidance and emotional numbing into two separate clusters and the addition of three symptoms (blame, persistent negative emotions, and reckless or self-destructive behavior).

Support for the *DSM–5* four-factor model of PTSD has been evidenced from confirmatory factor analytic findings using different measures and across numerous trauma and community samples and cultures (Biehn et al., 2013; Contractor et al., 2013; Elhai et al., 2012; Tay, Jayasuriya, Jayasuriya, & Silove, 2017). More

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recently, evidence has proposed PTSD is better conceptualized as five factors (Elhai et al., 2011), six factors (Liu et al., 2014; Tsai et al., 2015), and seven factors (Armour et al., 2015). However, some studies have found that the new modifications, particularly in light of the most recent seven-factor hybrid model (Armour et al., 2015), have resulted in substantial variation in prevalence estimates and preestablished risk factors, which may be the result of changes to Criterion A, the addition of Criterion C's having the presence of at least one active avoidance symptom, and the recently proposed complex factor structures (Kilpatrick et al., 2013; Murphy et al., 2017; Shevlin, Hyland, Karatzias, Bisson, & Roberts, 2017).

A more pertinent issue in PTSD research may be to assess the degree to which the measurement of PTSD is equivalent, or invariant, across different subpopulations and cultural groups. Extant theoretical and empirical evidence has suggested that despite males' experiencing higher rates of exposure to traumatic events, females have a twofold increase in risk of PTSD compared to males (Breslau et al., 1998; Pietrzak, Goldstein, Southwick, & Grant, 2011; Tolin & Foa, 2006). One possible explanation for females' being at a higher risk of PTSD has been argued to be dependent on the type of traumatic experience. Evidence has indicated that males and females differ in the types of traumatic exposure, with females' being more likely to report sexual abuse both in childhood and adulthood, whereas males are more likely to report higher levels of nonsexual assault and combat exposure (Breslau & Anthony, 2007; Mills et al., 2011; Olff, Langeland, Draijer, & Gersons, 2007; Tolin & Foa, 2006). It is important to note that evidence in this area is not always consistent and may also be dependent on certain sample characteristics; for example, no sex differences in risk for PTSD were reported among Operation Enduring Freedom and Operation Iraqi Freedom (OEF/OIF) veterans (Street, Gradus, Giasson, Vogt, & Resick, 2013). Moreover, a meta-analysis of sex differences in trauma and PTSD found that sex differences remained even when controlling of type of traumatic exposure (Tolin & Foa, 2006).

PTSD manifestations may also depend on variations in cultural and societal responses to stress, coping strategies, and available support mechanisms (see Hinton & Lewis-Fernández, 2011, for review). In a comparative study of the effects of Hurricanes Andrew and Paulina (both of which shared similar characteristics), Norris, Perilla, Ibañez, and Murphy (2001) found sex differences in vulnerability to disaster-related PTSD to be far greater in Mexico than in the United States. The authors postulated that this result may be partly explained by culturally specific gender roles on certain PTSD symptoms, given Mexico is a more patriarchal society than the United States. Additionally, another possibility for sex differences stems from findings suggesting that females are more likely than males to report depression and anxiety disorders (Kessler, Chiu, Demler, & Walters, 2005; Kessler, Chiu, Demler, Merikangas, & Walters, 2005). Indeed, it could be argued that higher prevalence rates of PTSD in women may be a reflection of a tendency for higher psychological distress or higher levels of co-occurring psychiatric problems. Finally, a number of individual and trauma-related characteristics such as sex-specific differences in psychological and biological reactions to trauma, appraisal of threat, coping styles, and social support (Olff et al., 2007) have been proposed to account for sex differences in PTSD. Therefore, in order for meaningful comparisons to be made, an important prerequisite is that measurement invariance is established. For example, if males and females differ in the how they interpret their emotional states, comparing them based on these emotional experiences would have little value.

One statistical approach to assessing measurement invariance is to examine the presence of differential item functioning (DIF). DIF is assessed by identifying differences in individual item scores across groups while controlling for the overall construct (latent variable) being measured. Within the literature there are different statistical methods for assessing DIF, each with its own advantages and disadvantages (see Teresi, 2006; Zumbo, 2007, for reviews). In one study, King, Street, Gradus, Vogt, and Resick (2013) used item response theory (IRT) to examine sex differences in U.S. military veterans, using the *DSM–IV* model of PTSD. Findings indicated that despite experiencing the same symptom severity, males reported more frequent nightmares, emotional numbing, and hypervigilance, whereas females reported more frequent distress reminders and concentration difficulties. Notably, the authors highlighted that these item-level differences were small and had little impact on measurement precision.

Sex differences in PTSD symptom expression, particularly *DSM–5* symptoms, is a relatively neglected area. However, in a study of adolescent survivors of an earthquake in Italy, sex differences in *DSM–5* PTSD symptoms were assessed (Carmassi, Akiskal, et al., 2014). Using the Trauma and Loss Spectrum Self-Report, Carmassi, Akiskal, et al. (2014) reported higher mean level rates in females relative to males for all PTSD symptom clusters. In subsequent analyses on adolescents who met the diagnostic criteria for PTSD, bivariate associations indicated significant item-level differences in nine out 20 PTSD symptoms for males and females. Specifically, higher rates of intrusive thoughts, distressing dreams, flashbacks, avoidance of reminders, negative emotional state, diminished interest, exaggerated startle response, and sleep disturbance were reported by females, whereas males reported significantly higher rates of reckless or self-destructive behavior. More recently, Carragher et al. (2016) examined sex differences in PTSD factor structure in a sample of Australian adults recruited via an online survey. Gender invariance of PTSD factor structure was assessed using multiple-group confirmatory factor analyses (CFAs), and gender differences in PTSD symptoms were assessed using Wald chi-square tests. They found females reported significantly higher rates of negative beliefs, diminished interest, restricted affect, and sleep disturbance than males. It is therefore important to examine whether these variations in PTSD symptom endorsement are the result of actual differences in PTSD or the result of measurement variance, which would obviate comparing PTSD across gender (Miles, Marshall, & Schell, 2008).

The current study aimed to examine sex differences in *DSM–5* PTSD symptoms using DIF in a sample of Malaysian adolescents following a natural disaster. The application of DIF is a robust method to disentangle group differences at the item level, which can be identified only after controlling for group differences on the latent trait. To date, no study has assessed for DIF in *DSM–5* PTSD symptom expression in a non-Western sample. This study intends to contribute to the limited evidence base of sex differences in the *DSM–5* model of PTSD to examine whether there are true group differences or a sex bias in diagnostic criteria. This question has important implications for the diagnostic criteria of PTSD and also in treatment planning, because it may be the case that gender-specific approaches should be applied to PTSD interventions. In this study the multiple indicators multiple causes (MIMIC) approach was used (Jöreskog & Goldberger, 1975). We selected this type of analysis because (a) it allows the specification and estimation of a multidimensional latent variable model with the grouping variable, (b) it provides a range of absolute and relative fit statistics, (c) it employs maximum likelihood estimation to deal with nonnormality, and (d) it has greater statistical power than multiple-group models. The first aim of the current study was to examine the factor structure of the *DSM–5* model of PTSD using confirmatory factor analysis to establish a baseline model. The second aim was to test the presence of DIF in PTSD symptomatology across both males and females.

Method

Participants and Procedure

The participants included in the present study are part of a wider project designed to examine the association between trauma exposure and physical health problems following a recent natural disaster (flood) in Malaysia (N = 731). The data used in the present study were obtained from 589 adolescents ages 15 to 19 years, with a mean age of 16.98 (SD = 1.20). The majority of the sample were females (n = 373; 63.3%). Self-reported ethnicity showed the participants were predominantly Malays 455 (77.2%), and the rest were Chinese, Indians, Bidayuhs, and Ibans. The majority of the sample (81.3%) were still living with both parents; 7.5% were living with one parent, and the rest lived with relatives or attended boarding school. Participants were recruited based on multistage sampling. They were contacted through the head of the villages and the school administrations. All participants provided written consent for participation, and for those who were underage, permission was obtained from parents or legal guardians. Ethical approval was endorsed by the Ethical Committee, Faculty of Medicine and Health Sciences, Universiti Malaysia Sarawak. Permission to conduct the study was obtained from the Malaysian Ministry of Education and the Malaysian Ministry of Health.

Measures

Traumatic exposure. Participants were presented with a list of traumatic and negative life events. Thirteen items were derived from the Life Events Checklist for *DSM–5* (Weathers et al., 2013a). These questions included direct and indirect exposure to a natural disaster, transportation accident, and sexual assault. An additional five items were added (based on the pilot study) to capture events such as near-drowning experiences, robbery, parental separation, persecution−humiliation, and childhood neglect. Participants were also asked to endorse their most traumatic event. The data were then screened to ensure that only participants who reported traumatic exposure were included. Of the full adolescent sample, 108 participants did not report traumatic exposure and were therefore removed from the analyses, leaving a final sample of 481. The majority of this sample were female 61.7%, with a mean age of 17.03 years.

PTSD was assessed using the Malay version of the PTSD Checklist for *DSM–5* (PCL-5; Weathers et al., 2013b). The PCL-5 consists of 20 items that correspond to the *DSM–5* PTSD symptoms. Participants are asked to indicate "how much have you been bothered by the problem in the past month," and responses are rated on a 5-point Likert scale (0 = *Not at all,* 1 = *A little bit,* 2 *Moderately,* 3 = *Quite a bit,* 4 = *Extremely*). To establish diagnostic rates, we applied the *DSM–5* algorithm, which requires at least one intrusion item (B1−B5), one avoidance item (C1−C2), two items from the negative alternations in cognition and mood (NACM; D1−D7), and two hyperarousal items (E1−E6). A rating of 2 (i.e., moderately) or higher for an item is treated as the presence of a symptom. The psychometric properties of the PCL-5 have been assessed across a variety of trauma-exposed samples, and the scale has demonstrated satisfactory reliability and validity (e.g., Bovin et al., 2016). In the current sample, the internal reliability was satisfactory for the full scale (α = .91) and each subscale: intrusions (α = .80), avoidance (α = .73), NACM (α = .85), and hyperarousal (α = .77).

Statistical Analysis

The analyses were conducted in three linked phases. First a confirmatory factor analysis of the *DSM–5* model was estimated to establish the fit of a baseline model. Robust maximum likelihood estimation (Yuan & Bentler, 2000) was used to allow parameters to be estimated using all available information. This method is considered superior to alternative methods of dealing with missing data such as listwise deletion (Schafer & Graham, 2002). A range of fit statistics were used to assess the goodness of fit for each model that included the chi-square, the comparative fit index (CFI; Bentler, 1990), and the Tucker−Lewis index (TLI; Tucker & Lewis, 1973). A nonsignificant chi-square and values greater than .90 for the CFI and TLI were considered to reflect acceptable model fit. Additionally, the root-mean-square error of approximation (RMSEA; Steiger, 1990) was reported, where a value less than .05 indicated close fit and values up to .08 indicated reasonable errors of approximation. The same cutoff values can be used for the standardized root-mean-square residual (SRMR; Jöreskog & Sörbom, 1996). The Bayesian information criterion (BIC; Schwarz, 1978) was used to evaluate and compare models, with the smallest value indicating the best fitting model. In examining BIC differences, it has been suggested that a difference of 6–10 indicates strong evidence of model superiority and a difference >10 indicates very strong evidence of model superiority (Raftery, 1996).

In the second phase of the analysis a multiple indicators multiple causes (MIMIC) model was conducted to examine sex differences using DIF on the PCL-5. MIMIC models test three types of relationships: (a) those between symptom items and the factors (measurement model), (b) those between the factors and group variable (structural regression coefficients), and (c) those between symptom items and group variable (direct effect). DIF is established when individuals from two different groups (e.g., sex) have the same underlying level of the latent variable but have different scores on the observed variables. Once the baseline model had been established, the latent variables were regressed on a variable representing sex (0 = males, 1 = females). Significant regression coefficients indicate significant mean differences at the level of the latent variable between males and females. In this stage of the analyses, direct paths between the grouping variable (i.e., sex) and observed indicators were fixed to zero. Third, the presence of DIF was examined by inspecting the modification indices (MIs) for the direct paths from the gender variable to the PCL-5 items. MIs indicate which path could be added to the model that would significantly improve model fit if freely estimated, that is, reduce the chi-square by 3.84 or more (which is the critical value for the chi-square for 1 degree of freedom). In practice, a more conservative value of 5 is used. A process followed whereby the path with the largest MI was freely estimated in the model and the model was reestimated. This continued until there were no MIs greater than 5. The improvement in model fit for the addition of each direct path was assessed using BIC. All analyses were conducted in Mplus 7.1 (Muthén & Muthén, 2013).

Results

The prevalence of PTSD based on the *DSM–5* diagnostic algorithm for the PCL-5 was high at 21.8% (n = 105), and females were significantly more likely than males (26.3% vs. 14.7%) to meet the diagnostic criteria for PTSD, $\chi^2(1, N = 481) = 8.94$, p = .003. The most common experiences were natural disaster, with 68.2% of the sample endorsing this event, followed by 54.1% reporting transportation accidents. The least endorsed item was direct exposure to combat (no participants endorsed this item), captivity (.6%), and sexual victimization (.8%). Males were more significantly more likely to report direct exposure to a transportation accident, $\chi^2(1, N = 481) = 21.34$, $p < .001$, and assaults with a weapon, $\chi^2(1, N = 481) = 7.54$ p = .002 (see the online supplemental material).

A series of one-way analyses of variance (ANOVAs) were conducted to examine sex differences in PCL-5 items (see Table 1). Females scored significantly higher on most PCL-5 items, with the exception of reckless or self-destructive behavior. However, according to Cohens d criterion (.2 small effect, .5 medium effect, .8 large effect; Cohen, 1988) the magnitude of these effects were small. The largest effect (.4) was for both avoidance items, emotional cue reactivity, negative emotional state, and exaggerated startle response. Significant sex differences were evident in eight of the 20 items: trauma-related amnesia, blame of self−others, diminished interest, detachment, irritability, restricted affect, poor concentration, and sleep disturbance. For both males and females, negative emotional state was the most strongly endorsed item; the least endorsed item for females was reckless or self-destructive behavior and for males distressing dreams.

Phase 1 of the analysis was to establish a baseline model. The fit statistics for the *DSM–5* model of PTSD yielded acceptable model fit, $\chi^2(164, N = 481) = 337.39$; BIC = 25,344.01; CFI = .94; TLI = .93; RMSEA = .05 (95% confidence interval [CI: .04, .05]); SRMR = .05. Although the chi-square statistic was statistically significant, this should not lead to the rejection of the models, because the power of the chi-square test is positively related to sample size (Tanaka, 1987). In Phase 2, the latent variables were regressed on a variable representing gender to

Table 1
Descriptive Statistics on Sex Differences in PCL-5 Items and Symptom Clusters

Symptom	Male	Female	Total	F(dfs), p	Cohen's d
B1. Intrusive thoughts	.90 (.88)	1.18 (.96)	1.07 (.94)	10.70 (1,479), p < **.001**	.3
B2. Distressing dreams	.44 (.73)	.60 (.84)	.54 (.80)	4.19 (1,479), p = **.041**	.2
B3. Flashbacks	.65 (.92)	.85 (.98)	.77 (.96)	5.03 (1,479), p = **.025**	.2
B4. Emotional cue reactivity	.98 (.98)	1.52 (1.24)	1.31 (1.10)	28.61 (1,479), p < **.001**	.4
B5. Physiological cue reactivity	.85 (1.00)	1.10 (1.16)	1.00 (1.11)	5.97 (1,479), p = **.015**	.2
C1. Avoidance of thoughts	.72 (.99)	1.18 (1.15)	1.00 (1.12)	19.85 (1,479), p < **.001**	.4
C2. Avoidance of reminders	.70 (1.01)	1.15 (1.13)	.98 (1.10)	19.43 (1,479), p < **.001**	.4
D1. Trauma-related amnesia	.58 (.90)	.71 (.99)	.66 (.96)	2.14 (1,479), p = .144	.1
D2. Negative beliefs	.76 (1.03)	1.09 (1.21)	.96 (1.16)	9.74 (1,479), p = **.002**	.3
D3. Distorted blame of self or others	.63 (.87)	.81 (1.07)	.74 (1.00)	3.73 (1,479), p = .054	.2
D4. Negative emotional state	1.23 (1.13)	1.70 (1.22)	1.52 (1.21)	17.76 (1,479), p < **.001**	.4
D5. Diminished interest	.60 (.95)	.78 (1.01)	.71 (.99)	3.69 (1,479), p = .055	.2
D6. Detachment	.70 (1.05)	.89 (1.14)	.82 (1.11)	3.48 (1,479), p = .063	.2
D7. Restricted affect	.59 (.95)	.76 (1.04)	.69 (1.01)	3.25 (1,479), p = .072	.2
E1. Irritability− aggression	.94 (1.08)	1.10 (1.20)	1.04 (1.16)	2.28 (1,479), p = .132	.1
E2. Reckless or self-destructive behavior	.71 (.95)	.51 (.85)	.59 (.89)	5.06 (1,479), p = **.025**	.2
E3. Hypervigilance	1.30 (1.29)	1.59 (1.22)	1.48 (1.26)	5.76 (1,479), p = **.017**	.2
E4. Exaggerated startle response	.71 (1.00)	1.12 (1.11)	.96 (1.09)	16.59 (1,479), p < **.001**	.4
E5. Poor concentration	1.18 (1.11)	1.35 (1.14)	1.29 (1.13)	2.69 (1,479), p = .101	.2
E6. Sleep disturbance	.91 (1.13)	1.09 (1.14)	1.02 (1.13)	2.69 (1,479), p = .102	.2
Intrusions	1.02 (1.33)	1.66 (1.60)	1.41 (1.53)	21.12 (1,479), p < **.001**	.4
Avoidance	.36 (1.33)	.70 (.57)	.57 (.79)	20.84 (1,479), p < **.001**	.6
NACM	1.35 (1.65)	2.04 (2.17)	1.77 (2.02)	13.90 (1,479), p < **.001**	.4
AAR	1.59 (1.67)	1.97 (1.69)	1.82 (1.69)	5.60 (1,479), p = **.18**	.2
Total	16.07 (11.73)	21.09 (13.51)	19.17 (13.08)	17.27 (1,479), p < **.001**	.4

Note. Symptoms preceded by a letter and number are in the *Diagnostic and Statistical Manual of Mental Disorders* (5th ed.; *DSM–5*). Data are means, with standard deviations in parentheses. Bold font indicates significant differences. PCL-5 = PTSD Checklist for *DSM–5*); NACM = negative alterations in cognitions and mood; AAR = alterations in arousal and reactivity.

examine the direct effects. This model made little difference to the overall fit, $\chi^2(180, N = 481) = 378.92$; BIC = 25,341.76; CFI = .93; TLI = .91; RMSEA = .05 (95% CI [.04, .06]); SRMR = .05. However, inspection of the modification indices revealed that direct effects from the gender variable to two items would improve the model fit if freely estimated. Each direct effect was added sequentially to determine whether there was significant DIF, while controlling for any difference in the overall level of the latent factor between groups. In the current analyses, the direct effect with the largest MI was reckless or self-destructive behavior (MI = 14.84), so the model was reanalyzed with this item freely estimated. The next path with the largest MI was for emotional cue reactivity (MI = 7.79) and was therefore reanalyzed with this item freely estimated. The fit of these models is presented in Table 2. The final DIF-corrected model was, $\chi^2(178, N = 481) = 355.28$; BIC = 25,324.21; CFI = .94; TLI = .93; RMSEA = .005 (95% CI [.04, .05]); SRMR = .05, which provided a better fit, as evidenced by a BIC decrease of 19.80. The factor loadings for the baseline and DIF-corrected models are presented in Table 3.

The regression coefficients for the structural effects of sex on the latent factors and the two items identified as demonstrating DIF—reckless or self-destructive behavior and emotional cue reactivity—are presented in Table 4. These findings indicate that females reported significantly higher levels of intrusions, avoidance, negative alterations in cognition and moods, and alterations in arousal and reactivity. The largest effect was for avoidance, with females having a mean score .48 of a standard deviation higher than males. The other effects were similar in magnitude and indicated that the mean differences between males and females ranged between .17 and .25 of a standard deviation. Further, the direct effects from the sex variable to two items were statistically significant. This indicated that females scored significantly higher on emotional cue reactivity (B4), whereas males were more likely to endorse higher rates of reckless or self-destructive behavior (E2) while statistically controlling for the latent variables in the model. The effect sizes were small, showing that males were higher than females by .34 units of a PCL-5 score and that females were higher by .27 units on the PCL-5.

Discussion

The main aim of the current study was to examine sex differences in the *DSM–5* model of PTSD criterion using DIF in a non-Western sample of Malaysian adolescents. The rationale for this study stems from literature noting sex differences in PTSD; however, DIF analyses on the PTSD symptomatology has been an understudied area, particularly in reference to the *DSM–5* model of PTSD. Therefore, this study adds to a nascent literature evaluating *DSM–5* PTSD symptoms. We found, consistent with previous studies of PTSD across a range of populations, significantly higher frequencies of PTSD diagnosis were found for females than for males (e.g., Tolin & Foa, 2006). This finding is consistent with a meta-analysis of PTSD in youths following a natural disaster that also found higher levels of PTSD in females relative to males (Furr, Comer, Edmunds, & Kendall, 2010). We also found that of all the PTSD symptom clusters, the largest effect was for avoidance. This finding may have important implications for research and practice because the higher levels of avoidance in females may be an area to target specific types of therapy, for example, exposure therapy, which specifically targets avoidance symptoms.

The results indicated the presence of DIF for two of 20 PTSD criteria. For females, despite scoring similar at the level of the latent trait, they had increased likelihood of endorsing emotional cue reactivity, whereas for males, this was the case for reckless or self-destructive behavior. These findings complement previous studies conducted in adolescent survivors of a natural disaster (Carmassi, Akiskal, et al., 2014) and Israeli adolescents exposed to terrorism (Pat-Horenczyk et al., 2007). There are many possible explanations for these specific sex differences in PTSD symptoms. One relates to the emotional appraisal of the traumatic stressor; for example, numerous studies have found that females experience heightened threat perceptions following trauma exposure (see Olff et al., 2007), which has been associated with the development and maintenance of PTSD (Ehlers & Clark, 2000). Another possible explanation relates to high rates of comorbidity with PTSD and other disorders, such as major depressive disorder and dissociation, whereby females also confer heightened risk for these conditions than do males (Kessler, Chiu, Demler, & Walters, 2005; Kessler, Chiu, Demler, Merikangas, & Walters, 2005; Olff et al., 2007). Further, the higher rates of reckless or self-destructive behavior, which is characterized by behaviors such as, risk-taking, reckless driving, and risky sexual behavior, are typical externalizing symptoms reflecting deficits in emotion regulation and impulse control (Friedman, 2013), which have been noted as common posttraumatic reactions for males, particularly younger males (Carmassi, Stratta, et al., 2014).

Notably, few studies have explored sex differences in *DSM–5* symptoms, and findings remain inconsistent. First, our findings revealed different observations from those of Carragher and colleagues (2016), who found females reported significantly higher levels of restricted affect, sleep disturbance, negative beliefs, and diminished interest. The current findings also differ from those of

Table 2
Model Fit Statistics from the MIMIC Model

Variable	$\chi^2(df, N = 481)$	BIC	CFI	TLI	RMSEA [95% CI]	SRMR
Baseline model	337.39 (164)***	25,344.01	.935	.925	.047 [.041, .054]	.049
Gender	378.92 (180)***	25,341.76	.929	.912	.048 [.041, .055]	.049
Gender > E2. Reckless or self-destructive behavior[a]	363.47 (179)***	25,328.14	.934	.922	.046 [.039, .053]	.048
Gender > B4. Emotional cue reactivity[a]	355.28 (178)***	25,324.21	.936	.925	.046 [.039, .052]	.047

Note. BIC = Bayesian information criterion; CFI = comparative fit index; TLI = Tucker−Lewis index; RMSEA = root-mean-square error of approximation; CI = confidence interval; SRMR = standardized root-mean-square residual.
[a] In the *Diagnostic and Statistical Manual of Mental Disorders* (5th ed.).
*** $p \leq .001$.

Table 3
Factor Loadings of the PCL-5 Items for Baseline Model and DIF-Corrected Model

	Baseline model		DIF corrected	
DSM–5 symptom	*b* (*SE*)	β (*SE*)	*b* (*SE*)	β (*SE*)
B1. Intrusive thoughts	1.00 (.00)	.73 (.03)	1.00 (.00)	.73 (.03)
B2. Distressing dreams	.69 (.07)	.59 (.04)	.69 (.07)	.59 (.04)
B3. Flashbacks	.95 (.07)	.68 (.03)	.96 (.07)	.68 (.03)
B4. Emotional cue reactivity	1.14 (.08)	.71 (.03)	1.10 (.08)	.69 (.03)
B5. Physiological cue reactivity	1.06 (.09)	.65 (.04)	1.06 (.09)	.65 (.04)
C1. Avoidance of thoughts	1.00 (.00)	.82 (.03)	1.00 (.00)	.82 (.03)
C2. Avoidance of reminders	.84 (.07)	.70 (.04)	.85 (.07)	.70 (.04)
D1. Trauma-related amnesia	1.00 (.00)	.53 (.04)	1.00 (.00)	.53 (.05)
D2. Negative beliefs	1.65 (.18)	.72 (.03)	1.65 (.18)	.72 (.03)
D3. Distorted blame of self or others	1.56 (.15)	.68 (.03)	1.56 (.15)	.68 (.03)
D4. Negative emotional state	1.82 (.20)	.76 (.03)	1.82 (.20)	.76 (.03)
D5. Diminished interest	1.36 (.13)	.69 (.03)	1.37 (.13)	.69 (.03)
D6. Detachment	1.47 (.17)	.67 (.04)	1.47 (.17)	.67 (.04)
D7. Restricted affect	1.31 (.13)	.65 (.04)	1.31 (.13)	.65 (.04)
E1. Irritability−aggression	1.00 (.00)	.61 (.04)	1.00 (.00)	.61 (.04)
E2. Reckless or self-destructive behavior	.66 (.07)	.52 (.05)	.70 (.08)	.55 (.04)
E3. Hypervigilance	.97 (.11)	.54 (.04)	.97 (.11)	.54 (.04)
E4. Exaggerated startle response	.83 (.10)	.53 (.04)	.83 (.10)	.53 (.04)
E5. Poor concentration	1.17 (.11)	.71 (.03)	1.16 (.11)	.72 (.03)
E6. Sleep disturbance	1.08 (.12)	.67 (.04)	1.06 (.12)	.66 (.04)

Note. DIF = differential item functioning; *DSM–5* = *Diagnostic and Statistical Manual of Mental Disorders* (5th ed.).

King and colleagues (2013), who found males reported significantly higher levels of nightmares, emotional numbing, and hypervigilance, whereas females reported higher levels of distress reminders and concentration difficulties. These findings highlight that despite several PTSD symptoms' appearing to manifest differently in males and females, these symptoms are not consistent across studies. However, it is important to note that there are methodological and sampling differences between these studies and the current study. First, these prior studies focused on adult populations, with a convenience sample of Australian adults who were recruited online (Carragher et al., 2016) and a U.S. veteran sample (King et al., 2013), highlighting important variations in terms of age, culture, and traumatic exposure. Second, although both the current study and that by King and colleagues used the appropriate versions of the PCL, the former was based on *DSM–IV* PTSD criteria, which did not include the three additional *DSM–5* symptoms. Third, the statistical methods used to assess sex differences in PTSD symptom expression were different, with multiple-groups CFA (Carragher et al., 2016) and item response theory methods (King et al., 2013). Clearly, more research is warranted before firm conclusions can be drawn.

The current study should be considered in light of several limitations. First, these results are based on a Malaysian adolescent sample following a natural disaster, which may explain the higher rates of PTSD in the current study compared with other community samples. Second, the current study tested only sex differences in PTSD symptoms; other studies have identified language, administration format, and type of self-report measure as important determinants of measurement variance (Palmieri, Marshall, & Schell, 2007; Miles et al., 2008). Third, we limited our CFA model testing to only the *DSM–5* model of PTSD, given the wide support for this model. Fourth, unfortunately we did not have additional

Table 4
MIMIC Model Effects of DIF Items and Overall Estimates of DSM–5 Factors

	Uncorrected model		Final DIF-corrected model	
Item	*b* (*SE*)	β (*SE*)	*b* (*SE*)	β (*SE*)
Intrusions	.30 (.07)***	.21 (.05)***	.25 (.07)**	.17 (.05)***
Avoidance	.48 (.09)***	.26 (.05)***	.48 (.09)***	.26 (.05)***
NACM	.17 (.05)**	.17 (.05)***	.17 (.05)**	.17 (.05)***
AAR	.17 (.08)*	.11 (.05)*	.22 (.08)*	.18 (.05)**
E2. Reckless or self-destructive behavior[a]			−.34 (.08)***	−.18 (.04)***
B4. Emotional cue reactivity[a]			.27 (.08)***	.12 (.04)***

Note. MIMIC = multiple indicators multiple causes; DIF = differential item functioning; *DSM–5* = *Diagnostic and Statistical Manual of Mental Disorders* (5th ed.); NACM = negative alterations in cognitions and mood; AAR = alterations in arousal and reactivity.
[a] In the *DSM–5*.
* $p \leq .05$. ** $p \leq .005$. *** $p \leq .001$.

measures of psychopathology to include in the analysis. Previous studies have noted that PTSD is comorbid with a range of other disorders, such as generalized anxiety disorder, major depressive disorder, substance abuse disorders, and suicide risk (Breslau et al., 1998; Pietrzak et al., 2011). Therefore, this is an important limitation of the current findings because we were unable to test whether these preexisting–co-occurring conditions may account for differences in PTSD symptom endorsement in males and females. Further, because depressive and anxiety disorders are more prevalent among women than men (Kessler, Chiu, Demler, & Walters, 2005; Kessler, Chiu, Demler, Merikangas, & Walters, 2005), it is possible that the higher female endorsement may reflect a greater degree of generalized distress, as opposed to PTSD-specific distress (Parker-Guilbert, Leifker, Sippel, & Marshall, 2014).

To conclude, the current findings add to a nascent literature examining sex differences in the *DSM–5* model of PTSD symptom expression. Such research has important implications because establishing that PTSD is invariant across different subpopulations and cultures is vital to being certain that researchers are measuring the same construct in the same metric; otherwise conclusions regarding differences are redundant (Widaman, Ferrer, & Conger, 2010). However, although some evidence suggests that certain PTSD symptom clusters vary across different cultures (Hinton & Lewis-Fernández, 2011), the revised *DSM–5* criteria of PTSD has been supported across a range of cross-cultural populations and specifically in Malaysia (e.g., Ghazali, Elklit, Balang, Sultan, & Kana, 2014; Tay et al., 2017). Of importance, despite the current findings revealing differences in two items, it should be noted that these effects were small and should not be interpreted as providing firm support of nonequivalence across sex. This is consistent with the findings reported by King et al. (2013), who also found that the presence of DIF had little impact on measurement precision in a veteran sample. It is therefore possible that gender role stereotypes (e.g., women have a higher susceptibility to posttrauma reactions; Parker-Guilbert et al., 2014; Tolin & Foa, 2006), rather than a bias in diagnostic criteria, may be involved. Clearly, future research is warranted to establish whether sex differences in certain items are consistent across different conceptualizations of PTSD and different cultural contexts.

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